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Assessing the Migration and Social Instability Nexus in Sub-Saharan Africa: A Spatial Analysis

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Abstract

The reverse effects of migration in enhancing small scale social unrest seem less regarded in the existing studies on social conflicts in Africa. Thus, this paper proposes to reversely assess the migration and social instability nexus in Africa, exploiting data on 'riots and protests' and 'violence against civilians'. In addition to geographical spillovers in social instability, our results indicate that increasing migrants stock enhances small-scale internal conflicts in African countries. On the contrary, good economic performances and openness to trade are found to be reducing social conflicts. Globally, our results impel political actors and regional unions to further implement specific policies for the inclusive integration of regional migrants.

Keywords: Small scale conflicts, migration, spatial spillovers, development, SSA.
JEL classification: C23, Q34, O15, O55.

1. Introduction

Existing studies on the causes of international migration across Africa mention natural disasters, climate change, wars and ethnic conflicts (Adepoju, 1998; Collier and Hoeffler, 2002). Reversely, although there is no great consensus on the potential for migration to increase social unrest, recent contributions by Reuveny (2007), Salehyan (2008) Burrows and Kinney (2016) and Docquier et al. (2018), among others, discuss inter-state and internal conflicts induced by international migration to explain how the latter can lead to social contests. Furthermore, recent eruptions of anti-migrants clashes in countries such as Côte d'Ivoire, Nigeria and South Africa, among others,

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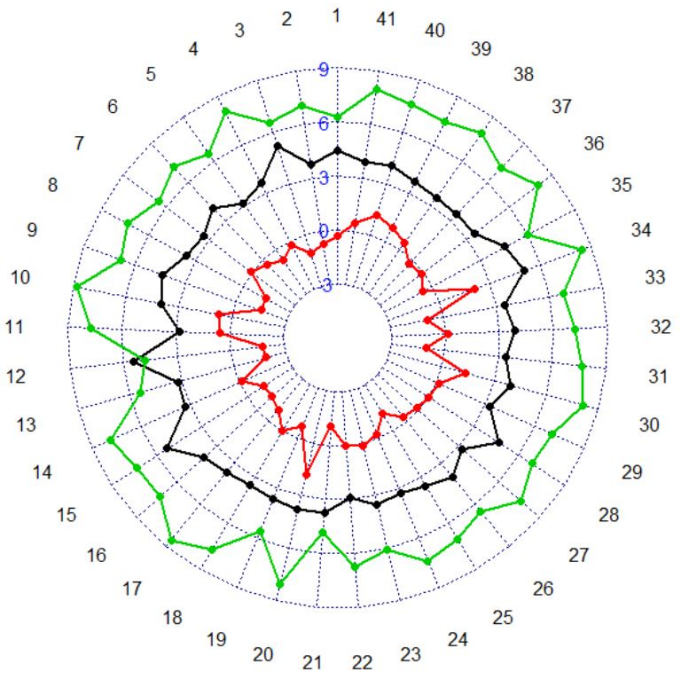
raise questions on the role of migration in strengthening social instability in Africa.[1] Thus, this paper is both empirics and theory driven and aims at empirically assessing the migration and social instability nexus in Africa, addressing spatial spillovers and inverse causality.

Does migrants stock enhance small-scale conflicts and social contests in the host country? The few existing theoretical and empirical literature suggests that increasing migrants stock seems to be among the drivers of the contexts over land ownership, business and job opportunities observed in some African countries (Docquier et al.,2018; Burrows and Kinney, 2016; Salehyan, 2008). In this perspective, there seems to be a bidirectional causality between the two phenomena (Freeman, 2017), justifying a focus on the migration-social contests relationship, when analysing the drivers of social instability in Sub-Saharan Africa (SSA). Moreover, considering social phenomena such as riots, protests and violence occurrence, surprisingly few research papers address the role of migration, even so in SSA. The present paper intends to fill in that gap.

Observing regional distribution of migrants stock and counts of 'riots and protests' justifies claims of possible links between both phenomena (Figure 1). For instance, peaks in 'riots and protest' and 'migrants stocks' are simultaneously observed in countries such as Burkina-Faso (4), Central African Republic (7), Côte d'Ivoire (10), D.R. of Congo (11), Kenya (20), Liberia (22), Nigeria (30), South Africa (34), among others. This implies that countries showing high occurrence of social conflicts are also countries where large migrants stocks are identified. A further aspect while only considering 'riots and protests' (Figure 1 and A-2) is the case of countries with relatively low levels of social instability such as Chad, Djibouti, Equatorial Guinea and Gabon, but surrounded by countries with high levels of 'riots and protests'. Does this signal some geographical spillovers? Since social conflicts in a country lead to migrants flow towards neighbouring countries and as migrants stock likely drive social instability in host countries, it is meaningful to consider regional spillovers, when addressing the migration-instability nexus.

[1] We are essentially referring to recent migrants-natives conflicts in Côte d'Ivoire and to recent deadly anti-foreigner acts of violence in South Africa.



Notes: 1-41 correspond to countries' ID.
Source: The authors, based on data drawn from the WDI and ACLED. See Descriptive Statistics for details on the data.

lnRiots and Protests
lnGDP per capita
lnMigrants stock

Figure 1: Mean 'Riots and protests', Migrants stock' and Income per capita observed between 1997-2010 in SSA.

1-Angola, 2-Benin, 3-Botswana, 4-Burkina Faso, 5-Burundi, 6-Cameroon, 7-Central African Republic, 8-Chad, 9-Congo, 10-Côte d'Ivoire, 11-Democratic Republic of the Congo, 12-Equatorial Guinea, 13-Eritrea, 14-Ethiopia, 15-Gabon, 16-Gambia, 17-Ghana, 18-Guinea, 19-Guinea-Bissau, 20-Kenya, 21-Lesotho, 22-Liberia, 23-Madagascar, 24-Malawi, 25-Mali, 26-Mauritania, 27-Mozambique, 28-Namibia, 29-Niger, 30-Nigeria, 31-Rwanda, 32-Senegal, 33-Sierra Leone, 34-South Africa, 35-Swaziland, 36-Tanzania, 37-Togo, 38-Uganda, 39-Zambia, 40-Zimbabwe, 41-Sudan.

The added value of this study is in twofold. Firstly, reversely assessing the migration-instability nexus, this paper genuinely targets riots, protests and violence occurrence. Secondly, it highlights the existence of spatial contagions in riots and protests among SSA countries and accounts for inverse causality in the migration-instability link. To the best of our knowledge, this is the first study analysing the adverse effects of migration in enhancing 'riots and protests' in SSA. Thereby, we first propose a local constant kernel regression to globally assess the shape of the migrants stock and social instability nexus. Secondly, we perform a spatial regression analysis to work out causal link and find results suggesting that increasing migrant stock intensifies social instabilities. The proxies for social instability being country-level data, our results should be carefully interpreted. In any case, they do not systematically imply that migrants are the most prone or are the only ones to protest or revolt.

Sections 2 and 3 respectively overview the related literature and present our data.

Section 4 shows patterns of the migration-instability interconnection. In Section 5, we outline the main econometric specification. Section 6 presents and discusses our results. In Section 7 and 8, we check the results for robustness and conclude the analysis.

2. Related literature

The existing studies are unanimous in identifying mass population flows as a direct consequence of national and international conflicts (Davenport et al., 2003; Moore and Shellman, 2007; Rubin and Moore, 2007). Reversely, the potential for migrants stock to cause social unrest remains open to debate, motivating our study. Therefore, this literature review focuses on the determinants of conflicts and it further outlines the most recurrent transmission channels.

Recent theoretical contributions by Azam (2003), Kipré (2006), Reuveny (2007), Rocco and Ballo (2008), Martin et al. (2008), Dal Bó and Dal Bó (2012), among others, discussed the channels through which bilateral migration affects the prevalence of conflicts between the origin and destination countries. Testing theoretical conclusions, Docquier et al. (2018) find positive impacts of migration in interstate conflicts occurrence. Similarly, Reuveny (2007) focuses on migration caused by the absence of arable land, freshwater and natural disasters to explain how the arrival of mass environmental migrants can lead to natives-migrants contests over resources. In a slightly different perspective, Azam (2003) and Dal Bó and Dal Bó (2012) discuss policy strategies to avoid social conflicts and insurgences, while Martin et al. (2008) analyse the role of trade in promoting peace.

A large body of empirical works have been devoted to the determinants of conflicts and among others Ghobarah et al. (2003), Collier and Hoeffler (2004), Reuveny (2007), Fearon and Laitin (2011), Gonzalez-Garcia et al. (2016) and Freeman (2017). At global level, Collier and Hoeffler (2004) investigate the drivers of civil wars and identify income inequalities, weak political institutions as well as high ethnic and religious divisions, while Miller and Ritter (2014) argue that migrants stock drives conflicts occurrence in both their host countries and countries of origin. Moreover, the externalities and consequences of civil unrest are discussed in Ghobarah et al. (2003) and Salehyan and Gleditsch (2006) to conclude that flows of refugees are also responsible for the spread

of armed conflicts in the host countries, particularly in developing countries (Salehyan, 2008). Fearon and Laitin (2011) and Côté and Mitchell (2017) focus on migrants' role in ethnic and 'Sons of the Soil' conflicts, whereas Reuveny (2007), Michael and Conley (2012) and Burrows and Kinney (2016) explore the role of climate in inducing population displacement and social conflicts.

In the African context, a significant number of studies focus on the determinants of civil wars and inter-state conflicts occurrence. In addition to the ethnicity and resource abundance-conflicts hypotheses largely discussed in recent scholarship (Fearon and Laitin, 2000, 2003; Horowitz, 2001; Le Billon 2001), economic performances appear to be non-neutral in the incidence of conflicts across Africa. Among others, Collier and Hoeffler (1998, 2002) and Miguel et al. (2004, 2011) hold poor economic performances and income inequalities responsible for conflicts, whilst Bahaug and Rod (2006) work out local catalyst of conflicts such as population density and urbanization. For Miguel et al. (2004) and Hendrix and Salehyan (2012) changes in climate and deviations in rainfall patterns also lead to disruptive activities in Africa including riots and anti-government protests.

Finally, researchers also discuss whether migration is a pacifier or trigger of conflicts, working out some transmission channels. In this, Burrows and Kinney (2016) mention the role of religion, ethnicity, resource scarcity and business competition. Competing with locals for jobs, resources and opportunities, migrants' 'otherness' likely provokes resentment and further exacerbate local conflicts. In an interstate or bilateral perspective, Miller and Ritter (2014) and Docquier et al. (2018) discuss how migration through interest group, strategic advantage, immigration cost and ethnic tensions enhance social unrest. Migrants' vote in host countries and lobbyism for instance influence public opinion and likely raise incentive to intervene in their home countries, leading to interstate conflicts. Regarding immigration costs, nationals consider that migration negatively affect wages, welfare and reduce their chances to be employed, leading to protests. Moreover, ethnic and religious tensions between migrants and locals may leads to riots and protests from nationals.

Based on this migration-conflicts literature review, recurrent determinants of social conflicts such as income level, trade openness, colonial history, endowment in natural resources and foreign direct investments (FDI, net inflows) should be accounted for in our analysis. The following section describes the data.

3. Data and descriptive statistics

Empirically assessing the migration and social conflicts nexus, we exploit data reflecting the economic, social and political realities in the considered territories. For this purpose, we collected socio-economic data from the World Development Indicator (WDI) along with series from the World Governance Indicators (WGI). These essentially are series on GDP per capita, agricultural added value, trade (imports and exports) and series on demographic dynamics such as total population and population density. Regarding political institutions, we mainly consider indicators of political stability, control of corruption and quality of governance regulations, as both conflicts and migration are likely political institutions related.

As proxies for social conflicts and migration, counts of 'riots and protests', 'violence against civilians' and migrant population are considered. The series on social conflicts from the Armed Conflict Location and Event Data (ACLED) represent our main indicators of small-scale conflicts and social instability.[2] Altogether, the dataset includes 41 SSA countries observed between 1997-2010. Table 1 below quantitatively describes the series involved in the regression analysis.

Observing the dataset, the highest (lowest) levels in GDP per capita, population density and political stability are respectively observed in Equatorial Guinea, Gabon (Liberia and Dem. Rep. Congo), Rwanda and Burundi (Namibia and Mauritania), and in Swaziland and Ghana (Dem. Rep. Congo and Burundi). Moreover, the standard deviation of GDP per capita and population density (Table 1) show high values indicating not only heterogeneity in our sample, but also existing disparities among SSA countries despite their common geographical location. Similarly, concerning our indicators of conflicts and migration, the highest (lowest) occurrence of 'riots and protest'

[2]It is to mention that the World Development Indicator of migrant population also includes refugees

and population share of migrants are respectively observed in South Africa and Kenya (Eritrea and Burundi), and in South Africa and Côte d'Ivoire (Lesotho and Equatorial Guinea).

Table 1: Descriptive Statistics

Variables	Units	Mean	S.D.	Min.	Max.
Stock of migrants	In million	0.402	0.492	0.005	2.407
Violences against civilians	Count	27.160	68.327	0	741
Riots and protests	Count	12.580	30.362	0	368
GPD per capita, ppp.	In 1000 USD	2.486	3.859	206.60	27.346
Agriculture, value added	% GDP	29.316	16.473	2.032	80.075
Rent of natural resources	% GDP	14.978	14.858	0.184	89.166
Trade of good & services	% GDP	75.310	38.701	17.860	275.230
Government expenditures	% GDP	14.396	7.694	2.047	69.543
Population density	In 1000/km^2	60.432	73.818	2.135	439.268
Political Stability	Index	-0.542	0.930	-2.995	1.389
Regulation quality	Index	-0.516	0.817	-2.413	1.691

Notes: Number of countries, n = 41. Period, t = 14. Number of observations, T = 574.

4. The migration and social conflicts nexus

4.1. Does migrants stock Granger cause social conflicts

Being aware that correlations between social conflicts and migrants stock suggested by Figure 1 might not imply causality, we first explore the latter question relying on a Granger Causality test for panel data (Dumitrescu and Hurlin, 2012).

4.2. Migration and social conflicts: A non-parametric assessment

Prior to our main regression analysis, we propose a local constant kernel regression of the conflicts-migration nexus. The latter, contrary to parametric analysis, does not dictate any functional form and seems unlikely to suffer from misspecification.Thereby, we perform a non-parametric analysis for both indicators of social conflicts. Hereafter, the results of the Nadayara-Watson estimator showing the behaviour of 'riots and protests' and 'violence against civilians' to migrants stock.[3]

[3]The raw series are counts of migrants, 'riots and protests' and of 'violence against civilians'. Performing this regression, we log-transform the data using a $log(x_i + c)$ operator, where c is an

Observing the shape of the regression-lines for both indicators of social instability, one roughly notices almost similar patterns. These are sinusoidal but overall upward trends between the migrants stock and proxies for social conflicts. Such results support the positive relationship largely discussed in the literature concerning civil wars, inter-state conflicts and migration. Although our indicators of social conflicts do not involve armed conflicts, the outcomes of this primer non-parametric analysis suggest that increasing migrants stock is positively associated to the occurrence of small-scale conflicts and social instability in SSA.

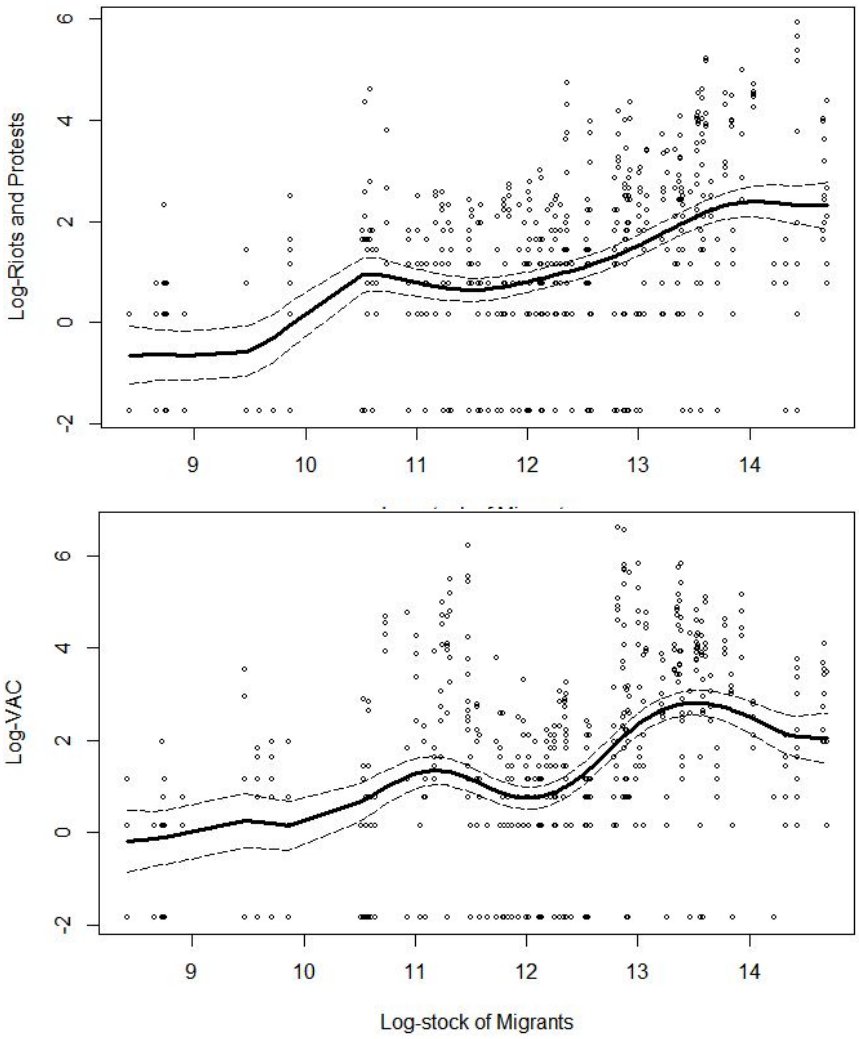


Figure 2: Social conflicts and migration: Non-parametric regression lines and confidence intervals

estimated parameter. For more details on modifying counts, see among others Anscombe (1948), Hoyle (1973) and Lambert et al. (2010) and Cameron and Trivedi (1998). Section 6 provides more details on the transformed data.

5. Econometric specification

Empirically testing theoretical predictions on social conflicts implication of migration, the econometric model relates a measure of conflicts, y_{it}, to a vector of socio-economic indicators X_{it} (including the stock of migrants). It starts by the following regression model, where the idiosyncratic errors terms, ε_{it}, are assumed to be identically distributed, $\varepsilon_{it}|X_{it} \sim iid(0, \sigma^2)$:

$$y_{it} = X'_{it}\beta + \mu_i + \varepsilon_{it},\ i = 1, 2, \ldots, n \ and \ t = 1, 2, \ldots, T. \tag{1}$$

μ_i stands for individual effects. In the presence of spatial spillovers in conflicts, the independence assumption of the disturbances ε_{it} is not satisfied, leading to biased estimates. Econometric textbooks, among others Anselin (2013), Arbia (2014), Baltagi (2001), and LeSage and Pace (2009) recommend spatial inference techniques, as these latter exploit information relative to geographical location, accounting for proximity between observations. Thus, working on series relative to riots and protests and further arguing that these phenomena may be spatially autocorrelated, we account for spatial spillovers. Thereto, considering a row-standardized weighting matrix $W_{n\times n}$, the regression model (1) becomes in matrix notation:[4]

$$y = \rho\,(I_T \otimes W_n)\,y + X\beta + I_T \otimes \mu + \varepsilon \qquad with\ \ |\rho| < 1 \tag{2}$$

$$\varepsilon = \delta(I_T \otimes W_n)\,\varepsilon + \epsilon \qquad with\ \ |\delta| < 1 \tag{3}$$

In equation (2) and (3), the parameters ρ and δ and the vector β are to be estimated, given $\epsilon \sim IID(0, \sigma^2_\epsilon I)$. In our context, the term $(I_T \otimes W_n)y$ represents the average conflicts occurrence (riots and protests) in the neighbouring countries, whereas $(I_T \otimes W_n)\varepsilon$ is the residuals spatial heterogeneity. Hence, the parameter ρ technically captures the spatial autocorrelation of the dependent variable and can be interpreted as the strength of regional contagion.

Equations (2) and (3) are the specifications we rely on.[5] The tests supporting the former specification, the remaining is estimating the parameters. Thereby, researchers

[4] This is a general from of the spatial linear regression model and it includes several different econometric models depending on whether δ, β_1 and/or ρ equal 0 or not. $|\rho| < 1$ stands for the stationarity condition.

[5] We actually performed specification tests to end up with these final forms. See Page 10 for tests results.

such as Kelejian and Prucha (1999), Anselin (2013) and Baltagi and Liu (2011) propose two steps maximum likelihood and 2SLS methods. Using the latter and closely following Millo and Piras (2012), we estimate the parameters of the spatial regression model addressing endogeneity.[6]

6. Results of estimation and discussions

Applying spatial regression in analysing the role of migration in social conflicts incidence, namely 'riots and protest' and of 'violence against civilians', some preliminary tests are relevant. These include log-transforming the count data and testing for spatial dependence.

6.1. Preliminary tests

Log-transforming the data: Modelling count data in linear regression models requires pre-processing the data (Lambert et al. (2010) and Cameron and Trivedi (2013)).[7] Thus, we apply the $\log(x_i + c)$ operator, where c is a constant between 0 and 1, which needs to be estimated. Anscombe (1948), depending on the situation, proposed certain values for c. Nevertheless, the most realistic approach is to exploit the relationship between the mean (μ) and variance (σ^2) in overdispersed Poisson model, $\sigma^2 = \mu + \frac{1}{c}\mu^2$, in estimating c for both our counts of 'riots and protests' and 'violence against civilians'.

QQ-plots: To inspect how the log-transformed series perform in using standard distribution compared to the raw data, we use a QQ-plot instead of performing a normality test.[8] Observing Figure 3 suggests that the log-modified series of 'riots and protests' and 'violence against civilians' are closer to the normal distribution than the raw counts.

[6] A comprehensive overview of this type of models is discussed by Millo and Piras (2012).

[7] Cameron and Trivedi (2013) argue that standard models counts are models in exponential family such as Poisson Gamma mixture models. However, linear modelling based on log-transformed data are also feasible.

[8] This because using the Shapiro-Wilk test for instance, even in case of acceptance of H_0, no serious conclusion regarding the normality of the series can be made, as the test is biased by sample size.

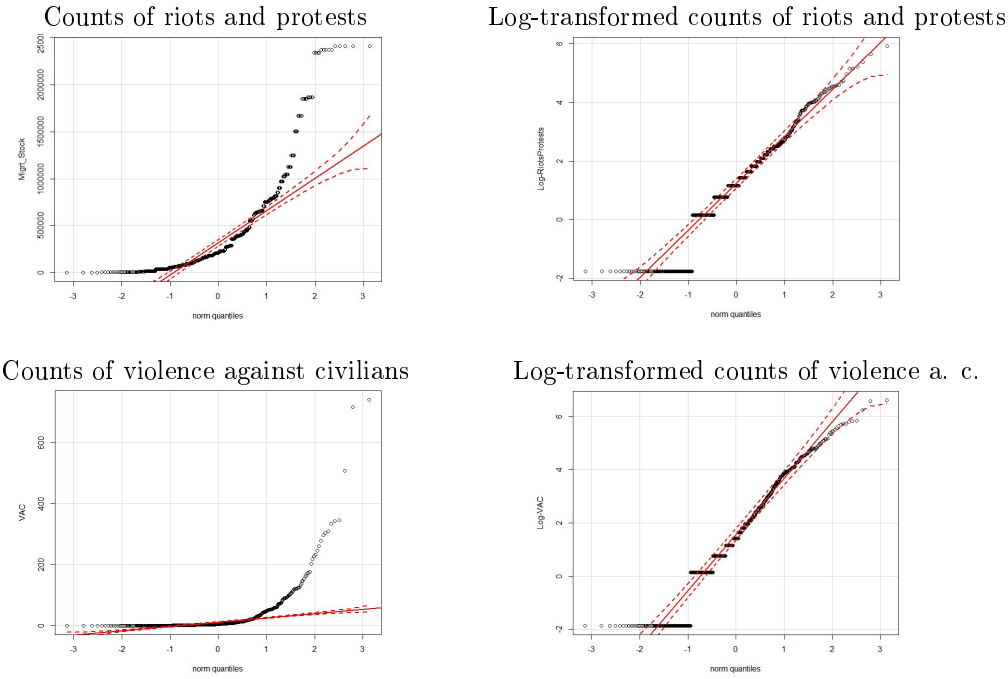


Figure 3: Quantile-quantile normal plots of counts vs. log-transformed counts

Tests for spatial dependence: Prior to any estimation, we test for spatial dependence in social instabilities and in the residuals of the different model specifications (Model 1-5). The results of the robust LM-tests help clarify this. In Table 2[†], observing the tests results for spatial effects, one notices that the test statistics globally reject the null-hypothesis concerning the absence of spatial effects in conflicts occurrence as well as in the residuals of the different specifications. Therefore, modelling the social conflicts and migration nexus in SSA, both spatial lag and spatial error dependence should be accounted for.

6.2. Results discussion

Reversely analysing the migration and social stability nexus, we mainly rely on pooling the data, passing over the individual effects.[9] Doing so and accounting for the results of the preliminary tests, we consider spatial autocorrelation in the proxies

[9]Observing first the results of estimations and of spatial tests, pooled models performed better than FE and RE in terms of information criteria. Further, although there seems to be no consensus on whether to pool or not, econometricians such as Baltagi and Griffin (1997) Pesaran and Smith (1995), and Baltagi et al. (2008) agree that in panel datasets with t small, pooled models are a viable alternative.

for social instability as well as in the residuals of the different specifications (Model 1-5).

6.2.1. Addressing endogeneity

Throughout the existing scholarship, it is noticed that migration is driven by a complex combination of economic, social, demographic and political factors, among others social conflicts. Therefore, the presence of migration among explanatory variables in our specifications yields endogeneity issues, which will lead to spurious regression, if not adequately addressed. To address that, we rely on instrumental variable technique estimating the parameters of the regression model (Model 1-5), using as instrument for migration a proxy for political institutions: The index for 'governance regulatory quality'.[10] Thus, in the first stage we regress log-modified counts of migrants stock on the index for regulatory quality and exploit the predicted values in the second stage model to estimate the parameters.

6.2.2. Results of estimations

Table 2 reports the results of estimating the parameters of the spatial model, in addition to average direct and total impacts of changes in the regressors. Observing the results in Table 2, the presence of spatial spillovers in social instability is noticeable. In this case where 'riots and protests' are used as indicator of social conflicts, the results suggest that riots, protests and social instability in neighbouring countries are contagious, *ceteris paribus*. Globally, our regression analysis in all 5 specifications (Model 1-5) supports the existence of regional contagion (spatial spillovers) in social instabilities.

[10] Our main argument in choosing political institutions as instrument for migrants stock hosted by a country is that fleeing social conflicts in their home countries, emigrants choose regions where strong political institutions are observed.

Table 2: Results of estimating spatial models of riots and protests

Covariates / Models	Model 1	Model 2	Model 3	Model 4	Model 5
Spa. eff. in riots, $\hat{\rho}$	.398** (.095)	.404*** (.082)	.378*** (.088)	.390***(.080)	.374*** (.086)
Spa. eff. in residuals, $\hat{\delta}$	−.529*** (.126)	−.589***(.109)	−.513*** (.121)	−.580***(.112)	−.550*** (.119)
Intercept	−.3219 (2.230)	−3.220*(2.161)	−4.701**(2.216)	−3.278 (3.024)	−0.834 (3.175)
Log-Stock of migrant	.323* (.183)	.333**(.170)	.536*** (.184)	.483* (.273)	.443* (.275)
Ex-French colony		−.392***(.110)	−.554*** (.119)	−.573***(.118)	−.668*** (.128)
Population density			−.003***(.001)	−.003*** (.001)	−.004*** (.001)
Trade share in GDP			−.010** (.002)	−.006**(.002)	−.005** (.003)
Log-GDP per capita				−.132 (.089)	−.291** (.129)
Rents of nat. resources				−.008 (.006)	−.010 (.006)
Agriculture, value added					−.012* (.007)
FDI, net inflows					−.004 (.008)
Gov. expenditures					−.027*** (.009)
N. of observations	574	574	574	574	574
AIC criterion	1136.803	1131.012	1115.933	1113.132	1109.127
	Average direct impacts				
Log-Stock of migrant	.322* (.193)	.335**(.188)	.538*** (.194)	.486* (.295)	.445* (.288)
Ex-French colony		−.394***(.120)	−.556*** (.130)	−.576***(.127)	−.671*** (.137)
Population density			−.003***(.001)	−.003*** (.001)	−.004*** (.001)
Trade share in GDP			−.010*** (.002)	−.006**(.002)	−.005** (.003)
Log-GDP per capita				−.132 (.093)	−.293** (.141)
Rents of nat. resources				−.008 (.006)	−.010 (.007)
Agriculture, value added					−.012* (.008)
FDI, net inflows					−.004 (.009)
Gov. expenditures					−.027*** (.011)
	Total impacts				
Log-Stock of migrant	.534* (.151)	.559**(.316)	.862*** (.332)	.793* (.483)	.709* (.459)
Ex-French colony		−.658***(.219)	−.891*** (.248)	−.941***(.238)	−1.068*** (.261)
Population density			−.005***(.002)	−.005*** (.002)	−.006*** (.002)
Trade share in GDP			−.016*** (.004)	−.009**(.004)	−.008** (.005)
Log-GDP per capita				−.216 (.152)	−.466** (.230)
Rents of nat. resources				−.013 (.010)	−.016 (.011)
Agriculture, value added					−.019* (.012)
FDI, net inflows					−.007 (.014)
Gov. expenditures					−.043*** (.018)
	Robust LM-tests for spatial autocorrelation in dependent variable and in residuals†				
Sp. Autocor in Dep. Var	2.52 (.11)	7.93 (.00)	6.78 (.00)	8.45 (.00)	5.12 (.02)
Sp. Autocor in Residuals	2.73 (.09)	8.93 (.00)	6.85 (.00)	8.96 (.00)	5.44 (.01)

Notes: Dependent variable is the log-transformed counts of riots/protests. In bracket are robust standard errors. '***', '**' and '*' respectively stand for significativity level at 1, 5 and 10%. †Here we report the LM-statistics and in bracket p-values. For these tests, H_0 is the absence of spatial dependence.

Regarding migration, our results show positive effects of migrants stock on riots and protests occurrence, suggesting that migrants stock's potential in riots and social conflicts occurrence is not neutral in SSA. Consequently, not only conflicts drive migration as pointed out in the literature by Alvarado and Douglas (2010) and Moore and Shellman (2004), among others, the reserve effects also seems to exist. Such a result somewhat supports the conflicts over resources or 'son of soil' social contests hypotheses discussed in Fearon and Laitin (2011), the climate change, migration and conflicts nexus assessed in Salhyan (2008) and Burrows and Kinney (2016). Further, this empirical result on the migrants stock and riots and protest nexus helps explains recent anti-migrants protests and social conflicts observed in SSA countries such as South Africa, Côte d'Ivoire, Nigerian and Kenya, among others (see Kersting, 2009). Globally, our analysis supporting that social unrest often occur in SSA countries with large migrant population does not systematically implies that riots and protest are migrant caused or led.

A further aspect in interpreting the effects of migration on social conflicts remains in questioning the transmission channels through which migration can lead to riots and protests in the SSA context. Lack of integrating migrants, cohabitation problems with natives ethnics groups as well as land litigations are some of the most recurrent transmission channels encountered in the existing literature (Woods, 2003; Berry, 2009; Thaler, 2014). In the South African case for instance increases in criminality and high unemployment of nationals (immigration costs) are mostly noted as cause of the violent protests, while in Côte d'Ivoire it is the threat to political power.

Besides migration, introducing control variables into the model (income level, openness to trade and population dynamics) helps assess how economic performances, population growth and political history affect social instability in Africa. The GDP share of trade shows a negative link to riots occurrence implying that good economic performances more precisely openness to international trade reduces social instability and riots occurrence in SSA. Such a result is also present in the literature where researchers found that multilateral trade reduces the probability of local conflicts (Oneal and Russet, 1999 and Polachek et al., 1999). Similarly, GDP per capita is found to be lessening riots occurrence, as the corresponding estimated parameter is negative. The latter re-

sult highlights how increases in income level help avoid riots and protests across SSA, reversely suggesting that low income levels and poverty enhance riots and social instability. In addition to trade and GDP per capita, the added value of agriculture and central government expenditure are also found to be reducing social instability in SSA countries.

Our analysis has also controlled for demographic dynamics and colonial history of SSA countries. Population density shows negative and statistically significant effects on riots occurrence, indicating that concentration of population reduces the risk of social conflicts. Contrary to the widespread viewpoint arguing that demographic pressure leads to social instability over soils, our estimates show negative link, strengthening the results by Collier and Hoeffler (2004) arguing that dispersed population (lower densities) are at a greater risk of civil war. Colonial history, measured in our regressions by a dummy variable equalling 1 when the considered country is a former French colony and 0 otherwise, shows a negative link to social conflicts. Compared to others European colonizers (British and Spanish) being an ex-French colony does not systematically generate riots and social instability.

In conclusion, reversely analysing the migration and social instability nexus in SSA countries, our results highlight geographical contagion in riots and protests, while suggesting higher migrants stock positively enhance riots and protest occurrence. Economic performances and trade openness appear to reduce social conflicts occurrence. Moreover, population growth and being a former French colony do not systematically trigger social instability in SSA.

7. Robustness check

Our study on the drivers of 'riots and protests' across SSA has found migrants stock to be positively enhancing social conflicts. The current robustness analysis aims at an in-depth analysis on the role of migration in the occurrence of social conflicts by using a different proxy for social instability: Counts of violence against civilians (VAC).

The first step requires testing for the existence of spatial autocorrelation in the dependent variable and in the residuals. Thus, considering VAC, we perform the same tests as above. The test results in Table A-1† (Model 3-5) support the presence of spatial

dependence in VAC as the test statistics reject the null hypothesis. In accordance with our initial results, positive spatial spillovers in social conflicts exist across SSA, meaning that the occurrence of violence against civilians in the neighbouring countries averagely leads to the same phenomena in a considered country, all things being equal. Using the log-modified counts of VAC, migrants stock still shows a positive and significant effect as above. This is, increasing migrants stock intensifies social instability and violence against civilians in the guest countries.

Economic factors such as the openness to trade, GDP per capita and the share of agriculture in GDP produce similar outcomes as above in reducing the occurrence of social conflicts. Likewise the results using riots and protests as indicator of social conflicts, this robustness analysis based on the occurrence of violence against civilians (VAC) suggests that good economic and living conditions help reduce the incidence of social conflicts. Control variables such as population density and colonial history are found to be negatively and significantly affecting conflicts. Again, being a former French colony does not trigger social instability and conflicts occurrence in SSA. Whilst the primer analysis reveals non-significant link of natural resources rents to social instability, this robustness check indicates positive and statistically significant effects. The dependent variables being different, such a change in the estimated parameter is quite feasible. In fact, it implies that natural resources abundance leads to social conflicts in SSA, supporting some popular narratives on the resource curse hypothesis. Deeper discussions on the role of natural resources in conflicts occurrence using different proxies for both phenomena help clarify this link. This is the case in Auty (2004), Abiodun (2007), Brunnschweiler and Bulte (2009) and Cotet and Tsui (2013), but is not the focus of this article which rather assesses the migration-social conflict nexus.

8. Concluding remarks

The existing literature on the migration and conflicts nexus provides large evidence that internal and inter-states armed conflicts lead to international migration. The reverse effect of migration in driving conflicts, while much less investigated, helps underline the bi-directional character of the migration and conflicts relation. Nevertheless, small scale social conflicts such as riots, protests and violence have received

significantly less attention in the existing works, creating a gap principally when considering SSA countries. In light of recent native-migrants clashes in SSA, this paper proposes to assess the role of migrants stock in riots and small-sale conflicts accounting for geographical spillovers and inverse causality. Thereto, we collected socio-economic data for a sample of 41 SSA countries observed between 1997 and 2010 from the WDI and the Armed Conflict Location & Event Data (ACLED).

In addition to the presence of spatial spillovers in social conflicts in SSA countries, our regression analysis points out positive effects of migration on social conflicts. This positive link remains unchanged throughout our five (5) different specifications, indicating that an increasing migrants stock significantly enhances social instability, namely 'riots and protests' and 'violence against civilians'. A non-parametric analysis primarily conducted on the migration-social conflicts link reveals clear patterns of an upward trend, supporting the latter parametric results. All other things being equal, increases in the migrants stock within a country lead to social instability, which appears to be itself spatially or geographically contagious across SSA. Several factors have been found to be pacifying social conflicts. This is the case of economic indicators such as GDP per capita, openness to trade, as well as population density. Regarding population density, our results indicate that the demographic pressure does not induce internal conflicts in SSA, contrary to common assertions.

In terms of political implications, as our results support positive spatial effects in conflicts, relatively peaceful and steady countries should actively participate in conflicts resolution in the neighbouring countries in order to avoid regional contagions. Moreover, openness to international trade and improvements in economic and living conditions through social and equitable resources distribution policies will help reduce risks of social instability in Africa. Political actors are impelled to implement policies promoting an inclusive integration of regional migrants.

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Appendix

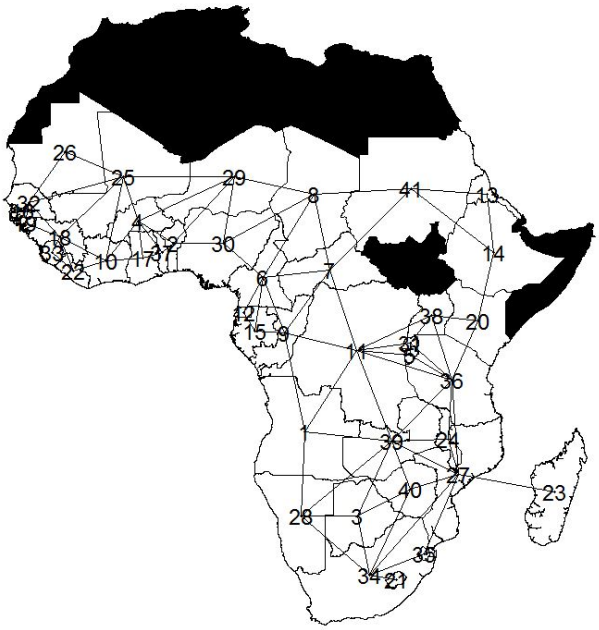

Figure A-1: Countries and borders based links surrounding the Matrix, W

List of countries

1-Angola, 2-Benin, 3-Botswana, 4-Burkina Faso, 5-Burundi, 6-Cameroon, 7-Central African Republic, 8-Chad, 9-Congo, 10-Côte d'Ivoire, 11-Democratic Republic of the Congo, 12-Equatorial Guinea, 13-Eritrea, 14-Ethiopia, 15-Gabon, 16-Gambia, 17-Ghana, 18-Guinea, 19-Guinea-Bissau, 20-Kenya, 21-Lesotho, 22-Liberia, 23-Madagascar, 24-Malawi, 25-Mali, 26-Mauritania, 27-Mozambique, 28-Namibia, 29-Niger, 30-Nigeria, 31-Rwanda, 32-Senegal, 33-Sierra Leone, 34-South Africa, 35-Swaziland, 36-Tanzania, 37-Togo, 38-Uganda, 39-Zambia, 40-Zimbabwe, 41-Sudan.

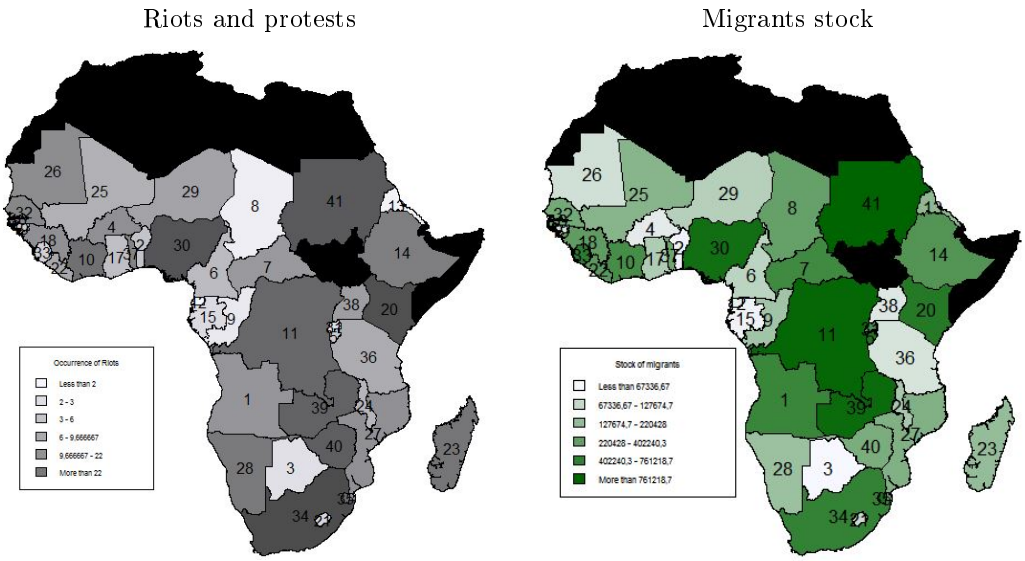

Figure A-2: Mean counts of 'riots and protests' and 'migrants stock' observed between 1997-2010 in SSA. Source: The authors based on data drawn from the WDI and ACLED. See Figure A-1 for corresponding country names.

Table A-1: Results of estimating spatial iv models of VAC

Covariates / Models	Model 1	Model 2	Model 3	Model 4	Model 5
Spa. eff. in VAC, $\hat{\rho}$	–	–	.360*** (.121)	.316***(.069)	.289*** (.075)
Spa. eff. in residuals, $\hat{\delta}$	.244*** (.051)	–	−.354*** (.105)	−.351***(.091)	−.307*** (.098)
Intercept	−4.905***(1.495)	−5.620***(1.496)	−1.874(2.216)	−.656 (1.346)	1.565 (1.742)
Log-Stock of migrant	.522*** (.123)	.618***(.123)	.347*** (.113)	.545* (.109)	.565***(.112)
Ex-French colony		−1.230***(.177)	−1.098***(.148)	−1.353***(.141)	−1.379*** (.151)
Population density			−.000(.001)	−.002* (.001)	−.002* (.001)
Trade share in GDP			−.014*** (.002)	−.012***(.002)	−.013*** (.003)
Log-GDP per capita				−.548***(.086)	−.781*** (.134)
Rents of nat. resources				.032*** (.005)	.034*** (.006)
Agriculture, value added					−.017** (.007)
FDI, net inflows					.001 (.009)
Gov. expenditures					−.012 (.011)
N. of observations	574	574	574	574	574
AIC criterion	1222.521	1209.625	1184.047	1146.425	1144.029
	Average direct impacts				
Log-Stock of migrant	-	-	.348*** (.119)	.547* (.113)	.565* (.115)
Ex-French colony		-	−1.102*** (.161)	−1.356***(.151)	−1.382*** (.162)
Population density			−.000 (.001)	−.002* (.001)	−.002** (.001)
Trade share in GDP			−.014*** (.002)	−.012***(.002)	−.013*** (.003)
Log-GDP per capita				−.550***(.091)	−.782** (.138)
Rents of nat. resources				.032***(.005)	.035***(.006)
Agriculture, value added					−.018* (.008)
FDI, net inflows					.000 (.010)
Gov. expenditures					−.012*** (.012)
	Total Impacts				
Log-Stock of migrant	-	-	.542*** (.192)	.797*** (.177)	.794* (.179)
Ex-French colony		-	−1.718***(.329)	−1.978***(.288)	−1.939*** (.308)
Population density			−.000(.001)	−.003 (.001)	−.003*** (.002)
Trade share in GDP			−.022***(.004)	−.017**(.004)	−.018** (.004)
Log-GDP per capita				−.802***(.152)	−1.097** (.229)
Rents of nat. resources				.046***(.008)	.049***(.010)
Agriculture, value added					−.025* (.012)
FDI, net inflows					.001 (.014)
Gov. expenditures					−.016*** (.017)
	Robust panel LM-test for spatial autocorrelation in dependent variable and in residuals[†]				
Spatial lag dependence	.05 (.81)	2.04 (.15)	21.79 (.00)	21.02 (.00)	14.33 (.00)
Spatial error dependence	3.67 (.05)	.16 (.68)	15.49 (.00)	16.13 (.00)	10.28 (.00)

Note: Dependent variable is log-modified counts of violence against civilians (VAC). Robust standard errors are in brackets. '***', '**' and '*' respectively stand for significativity level at 1, 5 and 10%. [†]Here we report the LM-statistics and in bracket p-values. For these tests, H_0 is the absence of spatial effects.

Table A-2: Riots/Protests: Estimation of FE models

Covariates / Models	Model 1	Model 2	Model 3	Model 4	Model 5
Log-Stock of migrant	.554***(.048)	.561***(.047)	.584***(.054)	.585***(.055)	.593***(.059)
Ex-French colony		−.414**(.139)	−.585***(.145)	−.578***(.145)	−.563***(.150)
Population density			−.003***(.001)	−.004***(.001)	−.004***(.001)
Trade share in GDP			−.001 (.002)	.002 (.002)	.001 (.003)
Log-GDP per capita				−.071 (.091)	−.105 (.121)
Rents of nat. resources				−.009* (.005)	−.008 (.005)
Agriculture, value added					−.003 (.007)
FDI, net inflows					.000 (.009)
Gov. expenditures					.006 (.011)
N. of observations	574	574	574	574	574
F-stat (p-value)	54134. (2.2e-16)	72.62 (2.2e-16)	41.16 (2.2e-16)	28.32 (2.2e-16)	18.90 (2.2e-16)

Note: Dependent variable is log-modified counts of riots and protest as proxy for conflicts. The data, n=41 countries observed over t=14 periods. In bracket are robust standard errors. '***', '**' and '*' respectively stand for significativity level at 1, 5 and 10%. FE based on the within estimator.

Table A-3: VAC: Estimation of FE models

Covariates / Models	Model 1	Model 2	Model 3	Model 4	Model 5
Log-Stock of migrant	.549***(.059)	.569*** (.056)	.488*** (.065)	.545***(.061)	.559***(.065)
Ex-French colony		−1.189***(.166)	−1.158***(.174)	−1.269***(.163)	−1.261***(.168)
Population density			.001 (.001)	−.001 (.001)	−.001 (.001)
Trade share in GDP			−.005**(.002)	−.005* (.003)	−.006**(.003)
Log-GDP per capita				−.576***(.090)	−.712***(.136)
Rents of nat. resources				.037***(.005)	.042***(.006)
Agriculture, value added					−.010 (.008)
FDI, net inflows					−.008 (.009)
Gov. expenditures					.011 (.012)
N. of observations	574	574	574	574	574
F-stat (p-value)	86.14 (2.2e-16)	72.68 (2.2e-16)	38.36 (2.2e-16)	43.54(2.2e-16)	29.65 (2.2e-16)

Note: Dependent variable is log-modified counts of violence against civilians (VAC) as proxy for conflicts. See above for further comments

Table A-4: Model 1 based Durbin-Wu-Hausman test for endogeneity

	Riots/Protests as dependent variable	VAC as dependent variable
Second stage	Estimates	Estimates
Intercept	-4.438*** (1.011)	-.750 (1.223)
Log-Stock of migrants	.458*** (.083)	.183* (.103)
First stage residuals	.143 (.101)	.548*** (2.355)
F-stat. (p-value)	68.44 (2.2e-16)	55.23 (2.2e-16)

Note: First stage regression model: Log-Stock of migrants = Regulation quality + Trade. The parameter have been estimated pooling the data. For these tests, H_0 is regressor non endogenous.

Table A-5: Riots/Protests: Estimation of instrumental variable FE Models (FEIV)

Covariates / Models	Model 1	Model 2	Model 3	Model 4	Model 5
Log-Stock of migrant	.402* (.214)	.42** (.214)	.488** (.208)	.472* (.278)	.439* (.270)
Ex-French colony		−.345**(.155)	−.571*** (.159)	−.569***(.161)	−.666*** (.164)
Population density			−.003***(.001)	−.003*** (.001)	−.004*** (.001)
Trade share in GDP			−.011***(.002)	−.010***(.002)	−.010** (.003)
Log-GDP per capita				−.076(.105)	−.302** (.143)
Rents of nat. resources				−.006(.006)	−.008 (.006)
Agriculture, value added					−.018** (.008)
FDI, net inflows					−.003 (.009)
Gov. expenditures					−.031*** (.011)
N. of observations	574	574	574	574	574
F-stat (p-value)	3.51 (.06)	3.97 (.02)	11.776 (.00)	8.18 (.03)	2.25 (.04)

Note: Dependent variable is log-modified counts of riots and protest as proxy for conflicts. In bracket are robust standard errors. '***', '**' and '*' respectively stand for significativity level at 1, 5 and 10%. FEIV based on the within estimator.

Table A-6: VAC: Estimation of instrumental variable FE models (FEIV)

Covariates / Models	Model 1	Model 2	Model 3	Model 4	Model 5
Log-Stock ofmigrant	.490***(.129)	.611*** (.214)	.462*** (.124)	.673***(.120)	.670***(.121)
Ex-French colony		−1.228***(.178)	−1.243***(.183)	−1.404***(.172)	−1.466***(.176)
Population density			.001 (.001)	−.001 (.001)	−.001 (.001)
Trade share in GDP			−.013***(.002)	−.012*** (.002)	−.013***(.003)
Log-GDP per capita				−.625***(.097)	−.934***(.142)
Rents of nat. resources				.036***(.006)	.040***(.006)
Agriculture, value added					−.024** (.008)
FDI, net inflows					−.002 (.010)
Gov. expenditures					−.014 (.012)
N. of observations	574	574	574	574	574
F-stat (p-value)	14.47 (.00)	31.51 (.00)	26.24 (.00)	33.41 (.00)	23.48 (.00)

Note: Dependent variable is log-modified counts of violence against civilians.

Table A-7: Moran I-Test for spatial effects in 'Riots/Protests' considering each wave

Waves	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Moran I stat.	.131	-.098	-.184	-.096	-149	-.022	.236	-.071	-.088	-.065	-.001	.079	-.062	-.089
P-value	.084	.742	.919	.737	.864	.493	.010	.659	.713	.640	.413	.177	.629	.714

Note: For the Moran I-test, the null hypothesis is: absence of spatial dependence in the variable.

Table A-8: Moran I-Test for spatial effects in 'violence against civilians' considering each wave

Waves	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Moran I stat.	.048	.172	.207	.126	.114	.067	-.023	.223	.273	.231	.226	.149	.108	.136
P-value	.259	.041	.020	.092	.113	.206	.493	.014	.004	.012	.013	.061	.120	.078

Note: For the Moran I-test, the null hypothesis is: absence of spatial dependence in the variable.

The connectivity weighting matrix, W

ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00
2	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.25	0.25	0.00
4	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.17	0.17	0.00	0.00	0.17	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.20	0.20	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
8	0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
9	0.20	0.00	0.00	0.00	0.00	0.20	0.20	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.00	0.00	0.00	0.20	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.12	0.00	0.00	0.00	0.12	0.00	0.12	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.12	0.00	0.12	0.12	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
15	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.33	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.33	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.33	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.33	0.00
25	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.17	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.14	0.14	0.00	0.00	0.14	0.14	0.00
28	0.25	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.25	0.00	0.00
29	0.00	0.20	0.00	0.20	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.25	0.00	0.00	0.00	0.25	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.25	0.00	0.00
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.17	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.17	0.00
35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.12	0.00	0.00	0.12	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.12	0.00	0.00
37	0.00	0.33	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00
39	0.12	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.12	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.12	0.00
40	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.25	0.00	0.00
41	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.17	0.00	0.00	0.00	0.00	0.17	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: This connectivity weighting matrix is built considering the common borders between neighbouring countries.
Number of countries = 42. Number of non-zero links: 164, Percentage non-zero weights: 9.756. Average number of links: 4